Operating the Distributed Common Ground System

A Look at the Human Factor in Net-Centric Operations

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Imagine a situation commonplace in the mountains of Afghanistan. Taliban insurgents prepare to ambush an allied military convoy in Helmand Province. They coordinate a scheme of maneuver, attack sequence, and withdrawal between elements scattered in the hills above the convoy's chosen road. Thousands of miles away, in a 4,000-square-foot room packed with screens showing imagery, maps, telemetry, and video feeds, a signals intelligence (SIGINT) analyst in the 13th Intelligence Squadron recognizes the impending ambush. She quickly presses a button attached to her headset and speaks to a U-2 pilot half a world away: "Bat zero-six, this is GMS with an update for Widow zero-two." Details on the enemy ambush quickly follow, and the pilot switches over to the frequency monitored by Widow 02, a joint tactical air controller assigned to the convoy, to pass the intelligence to him.

However, the Airman's work is not complete. After the ground mission supervisor finishes her communication, the intelligence, surveillance, and reconnaissance (ISR) mission commander, the officer leading the crew exploiting intelligence from the U-2, directs all section leads in the room to rally around his position. Headsets come off, and a huddle forms in the center of the large room, which is noticeably increasing in energy. The ISR mission commander addresses his crew, discussing a plan to refine the coordinates of the potential ambushers. He turns to the leader of the analytical and reporting section, directing him to fuse the latest intelligence reporting in the area with historical SIGINT and imagery gathered within the unit and at other locations. The ISR mission commander develops a plan with another mission commander for two unmanned aircraft systems in the area, an RQ-4 Global Hawk and an MQ-1 Predator, to cross-cue intelligence from the U-2. Finally, he directs his crew to coordinate everything with their intelligence counterparts, the battalion S2 personnel in Widow's tactical operations center. Moments later, an Airman first class and a private first class, separated by 12 time zones, exchange what they know about the potential ambush in real time through a classified computer chat program, and a wave of intelligence about the enemy's location begins to arrive at Widow's tactical operations center. Within minutes, the Taliban hunters become the hunted.

Every day, intelligence professionals conduct combat operations like this one. They execute ISR operations that provide threat warning to patrolling soldiers and marines, find potential locations of improvised explosive devices along convoy routes, and track insurgents for targeting purposes. These professionals operate not only from remote forward operating bases in Iraq or Afghanistan but also from bases and agencies within the United States and around the world. Many of them are part of the Distributed Common Ground System

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Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
2009		**00-00-2009 to 00-00-2009**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Operating the Distributed Common Ground System: A Look at the Human Factor in Net-Centric Operations	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air Force Research Institute (AFRI),155 N Twining Street,Maxwell AFB,AL,36112**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**7**	

(DCGS), a unique and potent twenty-first-century weapon system.

Although the DCGS is a human system, its guiding documents and literature might suggest otherwise. For example, according to the *Air Force Distributed Common Ground System Enabling Concept*, "The Air Force Distributed Common Ground System . . . is a powerful, network-centric, global enterprise designated as the Air Force AN/GSQ-272 SENTINEL intelligence, surveillance, and reconnaissance weapon system."[1] This enabling concept, like many other DCGS documents, emphasizes network-centric operations and machine-to-machine technology as opposed to the skills of the intelligence professionals who operate the system. Discussions within the DCGS literature on human factors that either drive or impede the pursuit of "actionable intelligence" or the execution of the "kill chain" are often difficult to find.[2]

This lack of emphasis on the human factor inadvertently masks its centrality to the success or failure of the DCGS—a network-based, not a platform-based, weapon system. Indeed, one of the system's most distinguishing aspects is the fact that its performance is tied more to human than to platform capabilities.[3] In other words, the quality of the DCGS is defined less by machines and more by the complex and largely intangible web of human behaviors and abilities—the *human factor* within the system. RAND consultants John Arquilla and David Ronfeldt recognized this truism in 1997:

> The information revolution is not solely or mainly about technology; it is an organizational as well as technological revolution. Thus, the emphasis . . . is less on the advance of technology than on the challenges for organization—and on the interactions between technological and organizational changes that have implications for doctrine and strategy.
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> . . . The information revolution favors and strengthens network forms of organization, while making life difficult for hierarchical forms. The rise of network forms of organization—particularly "all channel networks," in which every node can communicate with every other node—is one of the single most important effects of the information revolution for all realms: political, economic, social, and military.
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> . . . This will place the U.S. military (and police) forces under growing pressures to formulate new concepts for organization, doctrine, strategy, and tactics.[4]

This passage describes the modern challenges and realities of conducting ISR operations within the DCGS weapon system, the Department of Defense (DOD), and the intelligence community (IC) as a whole. The DCGS is evolving into a family of interconnected "systems" that span the DOD and intelligence community.[5] The point getting lost in this evolution is that the DCGS is ultimately a system of people; the machines, software, and communications links are tools. Those who operate the Air Force DCGS understand that the human factor defines the system more than any other.

What (or Who) Is the Distributed Common Ground System?

Understanding the DCGS must begin with understanding the impact of ISR on the modern battlefield. According to the Air Force *Theater ISR CONOPS*, published in 2008, "Technology, the nature of the joint operating environment, and the modus operandi of U.S. adversaries have made the role ISR plays in joint operations more critical than ever."[6] ISR is in the real-time fight to such a great extent that commanders will not execute their mission without participation of specific ISR assets and units, such as the DCGS.

The DOD created the DCGS as an interoperable "family of systems" developed by each service as a result of lessons from Operations Desert Storm and Allied Force.[7] The Air Force's initial contributions to the DCGS were five interconnected distributed ground station (DGS) units equipped with

millions of dollars' worth of intelligence systems and, more importantly, manned with every type of intelligence and communications Airman. The DGS is "the foundation of the AF DCGS infrastructure, capable of processing and exploiting multi-source intelligence (multi-INT) and executing sensor control."[8] In addition to the five core sites, the Air National Guard operates a number of smaller and interconnected DGS units.

Because of the high-tech nature of DGS units, outsiders frequently view them as multi-INT processing, exploitation, and dissemination (PED) nodes for airborne ISR, reachback organizations, or intelligence fusion and production centers. These labels define part of their mission, but DGS units and the DCGS enterprise encompass much more. The Air Force does not treat the DCGS like traditional reachback organizations that provide support for long-range analysis and planning; rather, it integrates this system into combat operations in the same manner as any other weapon system. DCGS units conduct combat operations daily. Personnel take raw information, turn it into relevant intelligence, and deliver it to operators within minutes (or seconds, depending on the source) of its collection. These intelligence professionals, or ISR operators, receive training in the nuances of language, pictures, and video. However, their connectivity to combat operations creates a set of challenges familiar to traditional operators but relatively new to large intelligence organizations and units.

Operators understand the comment by German field marshal Helmuth von Moltke (the elder) that "no plan survives first contact with the enemy." In today's operational environment, reconciling the plan with reality is as important for ISR operators as it is for infantrymen or fighter pilots. Consequently, DCGS commanders must interpret guidance, translate purpose and intent, and make decisions that affect the battle. They must recognize and prioritize emerging requirements and determine which aspects of the plan to retain and which to jettison during execution. For example, if a troops in contact (TIC) situation arises and a DGS unit is executing a U-2 or Global Hawk mission in the area, should commanders drop or delay the planned collection targets in order to support the TIC? The answer to this question depends on dozens of variables, including guidance from higher headquarters, the importance of planned targets, the nature of the TIC, flight time, and PED timelines.

The outcome of these situations depends on the multiple skills and insights of a DCGS commander and crew—in particular, their ability to solve problems, communicate effectively, and think critically and creatively. ISR operators must deal with the ambiguity, friction, and incomplete information inherent in all military operations. An extensive training and education program is vital in preparing today's ISR operators for these demanding missions.

Training and Educating Distributed Common Ground System Crews

The DOD is beginning to recognize the mounting demands on intelligence personnel who conduct modern, net-centric warfare. For example, the *Theater ISR CONOPS* notes that "people are the foundation of joint, unified ISR operations, not platforms, sensors or technology. ISR personnel are now in the tactical fight. This requires a warrior ethos, critical thinking skills, creativity, and ability to make decisions under pressure and friction."[9] Training and educating ISR operators to meet these expectations remain a challenge for the services and national intelligence agencies.

Led by an officer (the ISR mission commander), an Air Force DCGS crew consists of several analysis and reporting segments (each led by a noncommissioned officer), which are modular and scalable, depending on the mission. The crew includes an all-source intelligence cell called the DCGS analysis and reporting team (DART), imagery intelligence (IMINT), full-motion video

(FMV) intelligence, SIGINT, measurement and signatures intelligence (MASINT), and sensor/mission planning segments. As in any small military unit, the leadership and experience of the officers and noncommissioned officers determine the DCGS crew's success. These leaders must understand the goals for the weapon system and ISR enterprise, and must guide their personnel toward fulfilling these missions. Training, therefore, should begin with a focus on the crew position and eventually expand to include the role of ISR operations in a campaign.

Like all operators, DCGS personnel must complete an extensive training program, beginning with formal training at Goodfellow AFB, Texas. Subsequently, Airmen arrive at their assigned DGS unit and spend the next three months going through mission-qualification training, after which they must pass a battery of tests and a formal crew-position evaluation. Upon completion of this field training, the intelligence group commander will designate the Airmen "combat mission ready" and assign them to a crew. Each DGS unit also conducts continuation training to update crew members on friendly and enemy weapons and tactics, intelligence preparation of the operational environment, and rules of engagement.

The formal aspect of the training program tests each crew member's rote knowledge and technical skills. However, military professionals understand that regurgitating information on demand and knowing how to use the switches and buttons do not guarantee operational effectiveness. Given the complexity of the DCGS mission, the most important skills are crew coordination, critical thinking, and problem solving. To test these skills, each segment leader and ISR mission commander must go through a verification process that presents several leadership and mission-related challenges. Preparation for the evaluation provides a number of additional benefits—most importantly, the interaction of crew members from different occupational specialties.

Ultimately, the training program for an Air Force DCGS attempts to find a balance between traditional "intelligence" and "operations" functions. Intelligence personnel can no longer afford to pigeonhole themselves into "analysis" or "collection" jobs. Modern warfare has created the demand for well-rounded *ISR operators* who possess not only analytical depth and operational knowledge but also a high degree of "systems thinking."[10] They must be able to weigh the capabilities and limitations of ISR, given a commander's goals and the enemy's most likely course of action. The skills of understanding what a crew member needs to know and how to discover it are relevant at all levels, from the tactical through the strategic. The ability to balance the efficient and effective use of ISR assets, units, and personnel is part of this complex process.

Operating Efficiently and Effectively

In the last few years, debates between military organizations over ISR have tended to degenerate into arguments between efficiency and effectiveness.[11] The parochial nature of these debates has created a paradigm that treats efficiency and effectiveness as competing, rather than complementary, notions. Arguments over where to locate and whom to give control of intelligence functions such as analysis and PED are central to this debate. Typically, arguments for placing ISR forward emerge from efforts to show greater effectiveness, while those for locating it in garrisons emphasize efficiency. In reality, efficiency and effectiveness can and should balance and complement one another, not compete. The DCGS functions on the principle that harmony must exist between operational-level efficiency and tactical-level effectiveness. "Distributed" DCGS operations achieve this balance by exploiting the capabilities and mitigating the limitations of net-centric warfare.

In the ISR context, the term *distributed operations* describes the ability of the DCGS to assign missions to any element within the enterprise, regardless of geographical

location, while maintaining a strong regional focus to its actions.[12] For example, in a single month, the California-based DGS supported ISR operations or crisis-action planning in four unified commands.[13] Tackling such a mission load presents challenges. Although a DGS unit is fairly large—as many as 500 personnel—the high demand for ISR can easily overwhelm it. Each DGS has a crew manning letter that determines the minimum number and type of crew members required for each kind of ISR mission. Although each DGS can surge and flex to a degree, the letter, which draws on historical precedent, combat needs, and commander's assessment of risk, determines the mission capacity for that station. Distributed operations allow the enterprise to flex entire missions or segments of missions between DGS units. For example, a Global Hawk mission may have more IMINT targets than a single DGS can handle, especially if the DGS is already working Predator and/or U-2 missions with FMV, IMINT, and MASINT requirements. When this happens, the DCGS operations center at Langley AFB, Virginia, can drive efficiencies throughout the enterprise by federating portions of that mission among several DGS elements. Essentially, a DCGS crew can operate "virtually," scattered among many locations.

This type of federation and distribution of operations, which is based on extraordinary networking capabilities, clearly enhances system efficiency. However, it also leads to some very understandable human-related concerns about effectiveness. The belief that ISR must be part of a single team involved in a single battle constitutes a strong argument against distributed operations. Commanders need to know that ISR personnel understand the issues within their areas of operations. The DCGS enterprise addresses this concern by working to establish habitual relationships between DGS units and supported components, thus allowing DCGS crews to maintain a regional focus and establish relationships with forward units. The network behind the DCGS allows it to flex support between theaters when required, but the enterprise is as consistent as possible when matching a DGS to a supported unit.

The DCGS enterprise also recognizes the importance of face-to-face interaction with supported units. The Air Force began deploying ISR liaison officers (ISRLO) in 2006 to forward-deployed Army and Marine Corps division-level headquarters to coordinate air component ISR capabilities and missions, including the DCGS. Just as the air liaison officer coordinates requirements for close air support, so does the ISRLO, but for ISR. As much as possible, ISRLOs come from the DGS unit that habitually supports that ground component or task force. This helps establish camaraderie and trust between these war-fighting units.

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The pursuit of actionable intelligence, the core mission of the DCGS, provides an even greater reason to deploy an ISRLO forward. Those who must take action (i.e., the forward-deployed commanders) determine the criteria for actionable intelligence. Frequently, commanders articulate those criteria via verbal or implicit communication as opposed to written orders. Someone not in the room with these decision makers may

not understand fully what they require. That is not to say that people cannot have meaningful communications and relationships via networks. The success of Internet social-networking tools like Facebook and Skype prove otherwise. That said, the ISRLO is incredibly valuable to the DCGS weapon system. Despite a loss in manpower, which can negatively affect the DCGS's efficiency, forward-deployed ISRLOs increase effectiveness by linking DGS units with combat forces.

The primary aim of the DCGS enterprise is to achieve a balance between effective and efficient operations. Manpower, logistical limitations, and the ever-increasing global demand for ISR continue to drive the efficient development of the DCGS enterprise. However, the recent emphasis on decentralized planning and execution of ISR has also highlighted the value of face-to-face relationships between ISR operators and those they support. Recognizing the impact that ISRLOs have had on the effectiveness of ISR support, commanders on the ground want their positions to expand to the brigade level.[14] In the end, both effectiveness and efficiency are necessary. Operating within the DCGS enterprise, and certainly the global ISR enterprise, requires finding the correct, complementary balance between the two.

Conclusion

In order to realize the full potential of net-centric operations, we must focus on the human factors influencing them. The network enables distributed operations, but, ultimately, well-trained professionals drive mission success. Therefore, as the demand for ISR grows, the requirement for more and better-trained ISR operators will continue to increase. This is already leading to an expansion of the PED federation beyond Air Force DCGS to intelligence units from other services. As the enterprise grows and achieves the vision of becoming truly interoperable, the joint community will have to find ways to promote the same training and operating standards to which Air Force DCGS "customers" have become accustomed.

Similarly, the need for direct interaction between DCGS operators and combat units will increase rather than diminish. Accordingly, we should expect technological improvements to enhance both the efficiency *and* effectiveness of ISR support to combat units. New and better technology is particularly important when it generates improvements in the interaction and relationships between ISR operators and intelligence users. Human networking tools are as critically important to the future of the ISR enterprise as are data manipulation and improvements in system networking. Technological improvements are only part of the solution. Expanding and appropriately manning the ISRLO positions below division level should occur in conjunction with manning and technological developments within the DCGS.

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The joint community should update intelligence doctrine to address the capabilities of network-based weapon systems and

the reality that ISR *is* operations. Intelligence professionals are making decisions integral to mission success. Their operations are incredibly dynamic and challenging. Planning, command and control, and execution of network-based ISR weapon systems, as well as the human infrastructure within those systems, should evolve to more closely mirror traditional operational methodologies. In other words, ISR operations should be guided by mission-type orders rather than a time-consuming collection-requirements management process.

Finally, the joint and intelligence communities need to look beyond the interoperable, interconnected network and decide what the DCGS task organization should look like in the future. As the demand grows for ISR across the globe, DCGS operations will shift between theaters and combatant commands more and more frequently. The DOD and intelligence community will have to determine the appropriate command and control relationships to address this requirement. They should consider standardizing and increasing interoperability among the military units comprising the DCGS federation, with the ultimate goal of making it a truly joint organization. Air Force DCGS, a system of highly focused military intelligence professionals, can provide a solid foundation for such an endeavor. ✪

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Notes

1. US Air Force, *Air Force Distributed Common Ground System Enabling Concept* (Washington, DC: Headquarters Department of the Air Force, 2005), 3. Hereafter referred to as *Air Force DCGS*.

2. The "kill chain" is defined as *find, fix, track, target, engage, assess*. See Air Force Doctrine Document 2-1.9, *Targeting*, 8 June 2006, 49, http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_1_9.pdf.

3. J. P. Harvey, "Circumstances and Technology: The Effective Tasking and Use of Network-Based Assets" (master's thesis, Naval War College, 2000), 7–9.

4. John Arquilla and David Ronfeldt, eds., *In Athena's Camp: Preparing for Conflict in the Information Age* (Santa Monica, CA: RAND, 1997), 5–6, http://www.rand.org/pubs/monograph_reports/MR880/.

5. See the *Distributed Common Ground/Surface System (DCGS) Homepage*, 25 October 2004, https://jit.fhu.disa.mil/dcgs/index.html.

6. US Air Force, *Theater ISR CONOPS* (Washington, DC: Headquarters Department of the Air Force/A2CP, 2007), iii.

7. Department of Defense, *Capstone Requirements Document for Distributed Common Ground/Surface Systems JROCM 001-3* (Washington, DC: Department of the Army/DAMO-RQ and Department of the Air Force/AF-XORR, 6 January 2003), 1.

8. US Air Force, *Air Force DCGS*, 19.

9. US Air Force, *Theater ISR CONOPS*, 31.

10. Systems thinking is "based on the perspective of the systems sciences that seeks to understand the interconnectedness, complexity, and wholeness of the elements of systems in relation to one another." Field Manual 3-24 / Marine Corps Warfighting Publication 3-33.5, *Counterinsurgency*, December 2006, 4-3, http://www.usgcoin.org/library/doctrine/COIN-FM3-24.pdf.

11. Michael T. Flynn, Rich Juergens, and Thomas L. Cantrell, "Employing ISR: SOF Best Practices," *Joint Force Quarterly* 50, 3rd Quarter (2008): 58, http://www.ndu.edu/inss/Press/jfq_pages/editions/i50/15.pdf.

12. Joint Publication 2-01, *Joint and National Intelligence Support to Military Operations*, 7 October 2004, III-10, http://www.dtic.mil/doctrine/jel/new_pubs/jp2_01.pdf.

13. Between July and September 2008, DGS-2 conducted ISR operations for US Northern Command, US Southern Command, US Central Command, and US European Command.

14. Raymond Odierno, Nichoel Brooks, and Francesco Mastacchio, "Evolving ISR," *C4ISR Journal* 7, no. 8 (September 2008): 38.